USA AMCOM

U.S. Army Aviation and Missile Command

ENABLING TECHNOLOGIES FOR MISSILES AND ROCKETS

Presented to

The 2nd Annual Missiles and Rockets Symposium

Presented by

William C. McCorkle

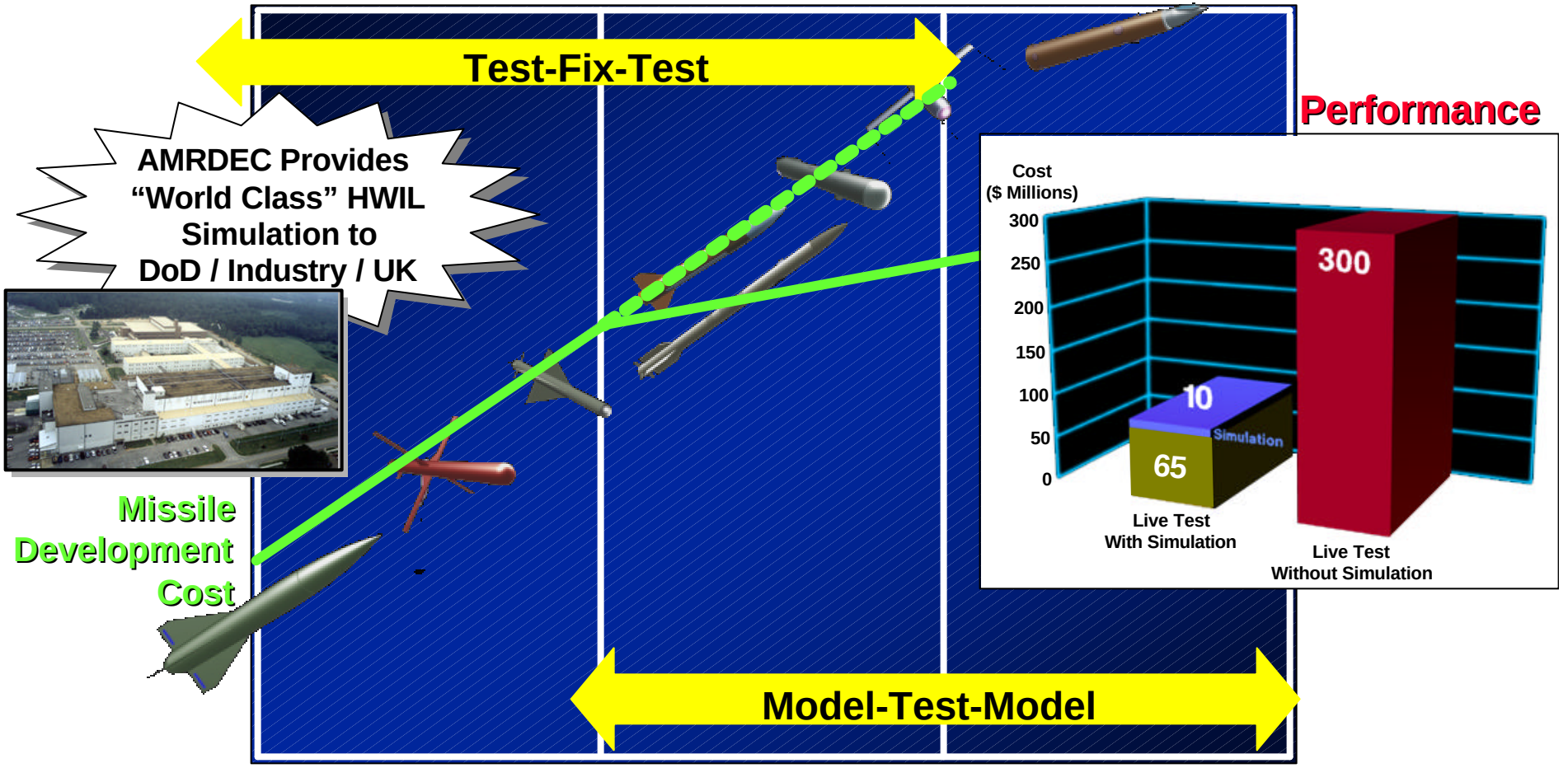
Director

Aviation & Missile Research, Development, and Engineering Center

U.S. Army Aviation and Missile Command

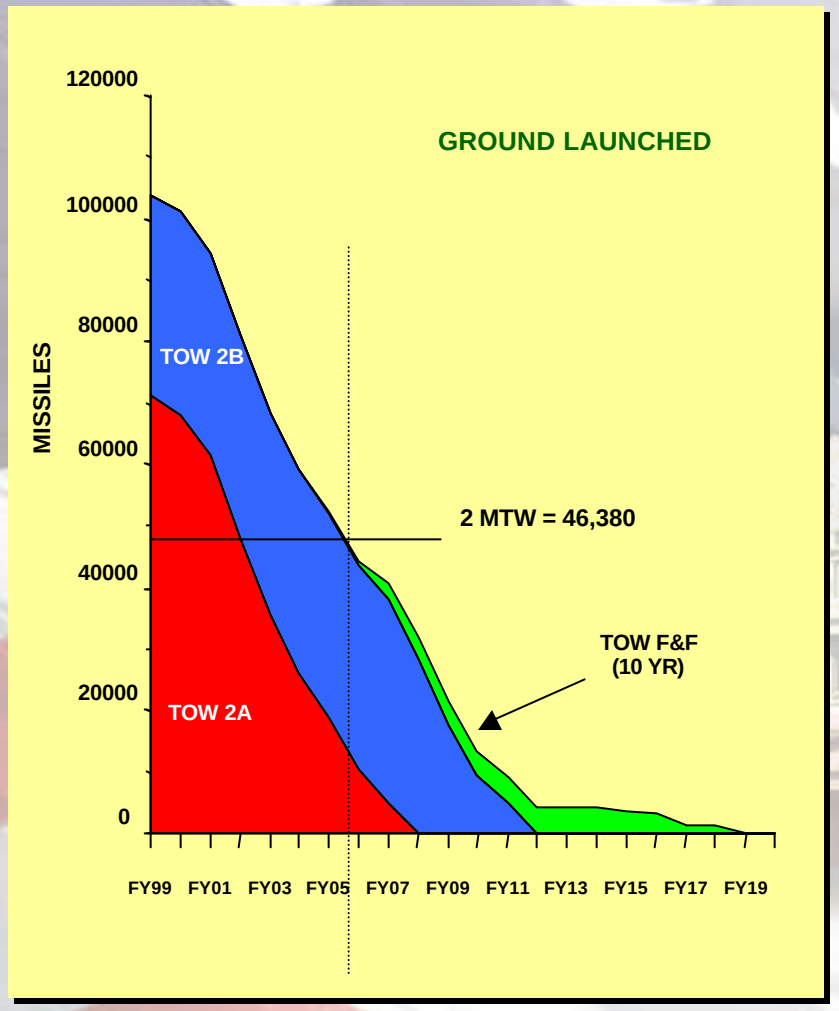
15 May 2001

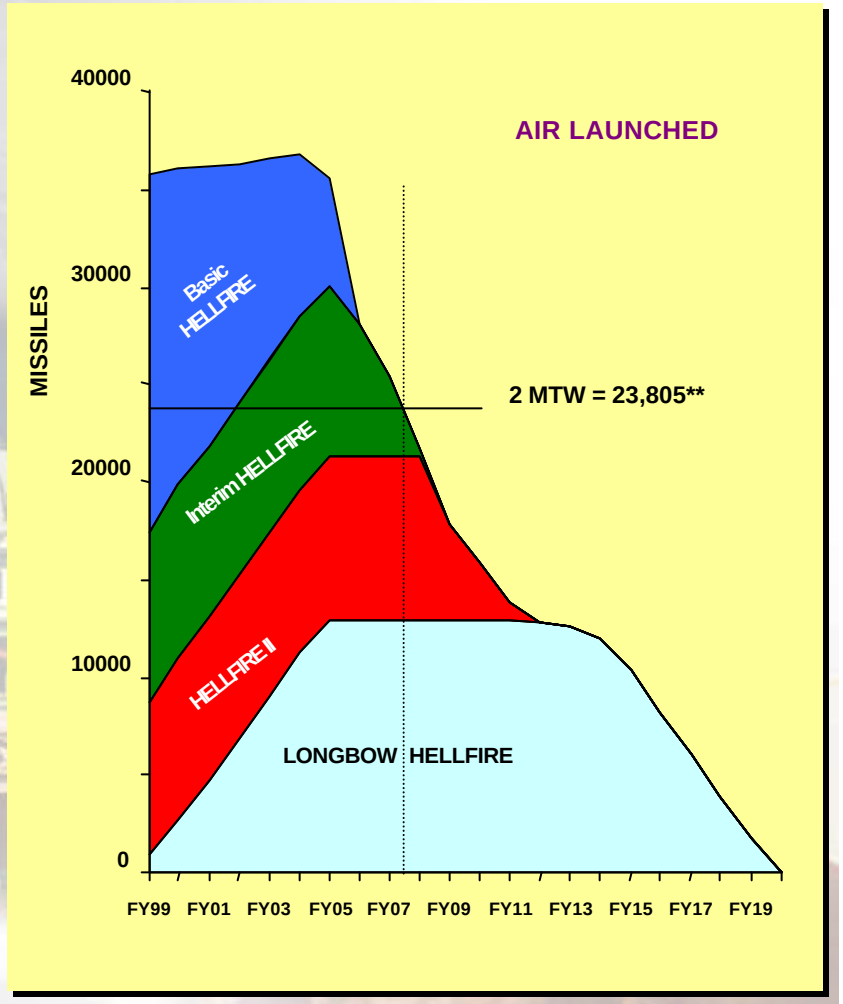
Hardware in the Loop Simulation
A Powerful Tool for Simulation Based Aquisition



Simulation Based Acquisition Reduces Development Cost

AGING MISSILE INVENTORY





EVOLUTION OF MANEUVER & AVIATION MISSILES

NEAR-TERM
(FY00 - 07)

MID-TERM
(FY08 - 16)

FAR-TERM
(FY17 – 25)

Ground

TOW 2A

TOW 2B

TOW F&F
(INTERIM LIGHT FORCE SOLUTION)

BASIC HELLFIRE

INTERIM HELLFIRE

HELLFIRE II

LONGBOW HELLFIRE

Air

* **MOD. H.F.**

COMMON CE MISSILE (Phase I)

COMMON CE MISSILE (Phase II)

TECHNOLOGY INSERTION THROUGH EVOLUTIONARY ACQUISITION

LONGBOW HELLFIRE

* Will be executed as part of CM Program.

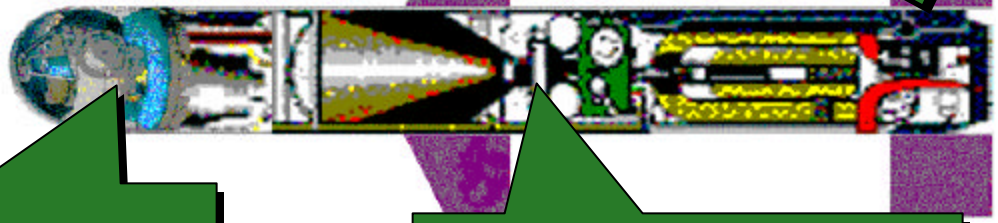
COMMON MISSILE ENABLERS/LEVERAGING TECHNOLOGY

Platform Integration

- AMRDEC Common Launcher
- AMRDEC Common Fire Control
- Future Combat System (FCS)
- Legacy Platforms

Propulsion

- DARPA NETFIRES-Pintle, Dual Pulse
- AMRDEC FMTI-Gel
- NAVY- Pintle
- NASA - Non-Carcinogenic Fuel



Seeker

- AMRDEC FMTI (FPA)
- DARPA NETFIRES (SAL/FPA)
- ARDEC TERM (SAL/MMW/FPA)
- USAF - IR CM Hardening

Warhead

- ARDEC
  - Short Stand-off Warhead
  - ADV Warhead
  - GEN2 EFP

Aggressively Seeking All Technical Opportunities Across Government / Industry Spectrum

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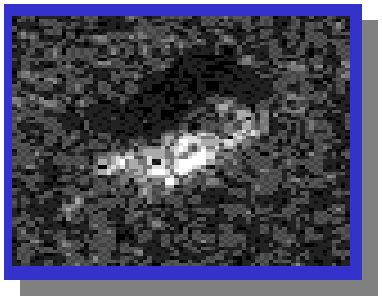
COMMON MISSILE PERFORMANCE PAYOFFS

Multimode Seeker Technology

- Selectable multi-spectrum sensors provide
  - expands operational effectiveness.
  - improved countermeasure performance.
  - greater adverse weather capability.
  - increased detection & acquisition.
- Enables sensor fusion technology (leap-ahead).

Semi-Active Laser
SAL

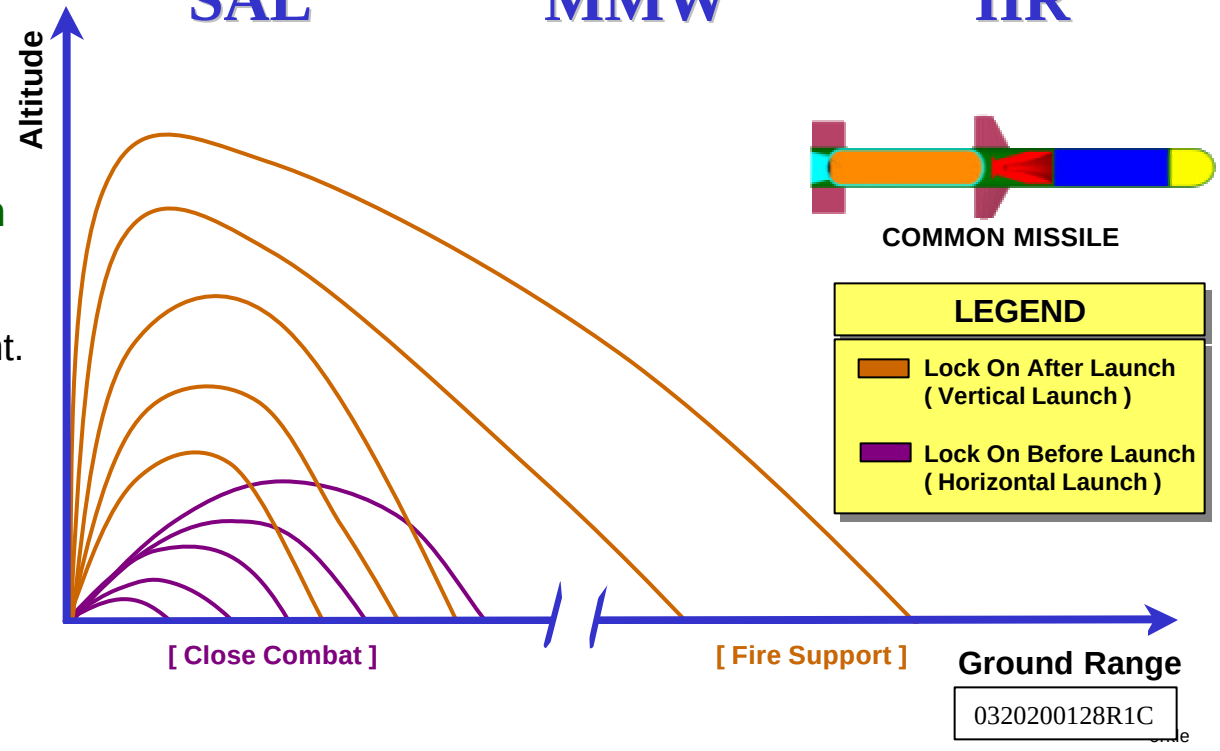


Millimeter Wave
MMW

Imaging Infrared
IIR

Controllable Thrust Propulsion

- Enables programmable mission profiling through fuel management.
  - scenario specific *(range, target…).*
  - tailorable flight profile *(TOF).*
  - extendable maximum range.
  - accommodates multi- launcher requirements *(horizontal & vertical).*



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NetFires
System Concept

New Military Capability

- Immediate firepower
- 5x-10x kills per ton vs current ordnance
- Large zone of influence
- Multimode seekers
- In-flight targeting
- Duration weapon

Family of Missiles

- Loitering Attack Missile (LAM)

- Precision Attack Missile (PAM)

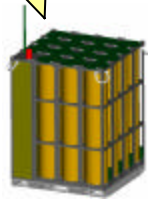
(Others possible)

Designed for Deployability

- Logistic efficiency through containerization
- No platform or crew required

Low Cost

- Reduced personnel and vehicles
  - LCC reduced > 50%
- CAIV design process
- Commonality of components and assembly



Modular Vertical Launch

- Self locating / orienting
- Unmanned operation
- Not platform specific
- Can be vehicle appliqué

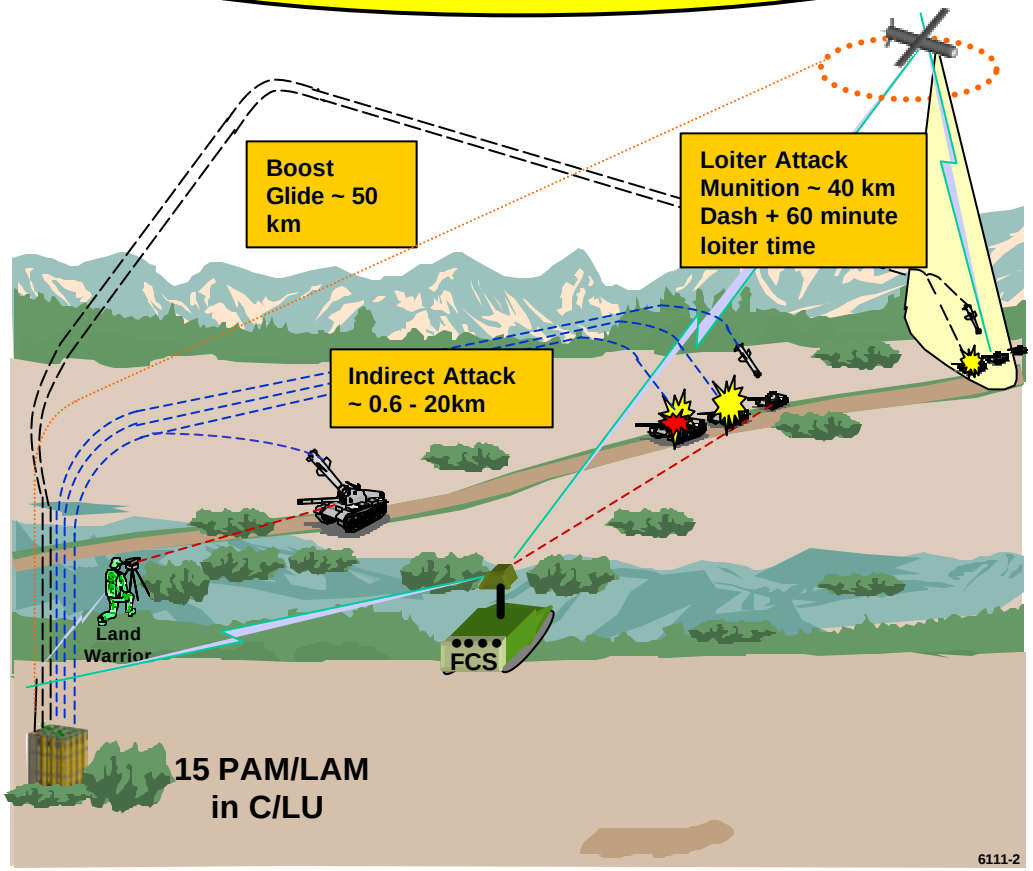
Containerized vertical launch provides immediate heavy firepower for early entry forces

NetFires Goals in FCS

Demonstrate two LOS/NLOS weapons

- **Rapid Response PAM ("virtual direct fire")**
  - **Short time of flight in "direct fire" mode (100s/20km)**
  - **Multimode terminal guidance**
  - **Low cost configuration**
  - **LOAL to 50 km**
- **Hunter Killer LAM**
  - **3-D LADAR seeker w/ATR**
  - **Significant loiter**
  - **Multi-mission including BDA**
  - **Can update / coordinate PAM/LAM attacks**
- **Common features**
  - **GPS/INS guidance**
  - **Variable propulsion**
  - **Terminal guidance**
  - **Midcourse update through networked 2-way data link**
- **Platform independent launcher**
- **Container command and control**

This fundamentally "reengineers close combat."

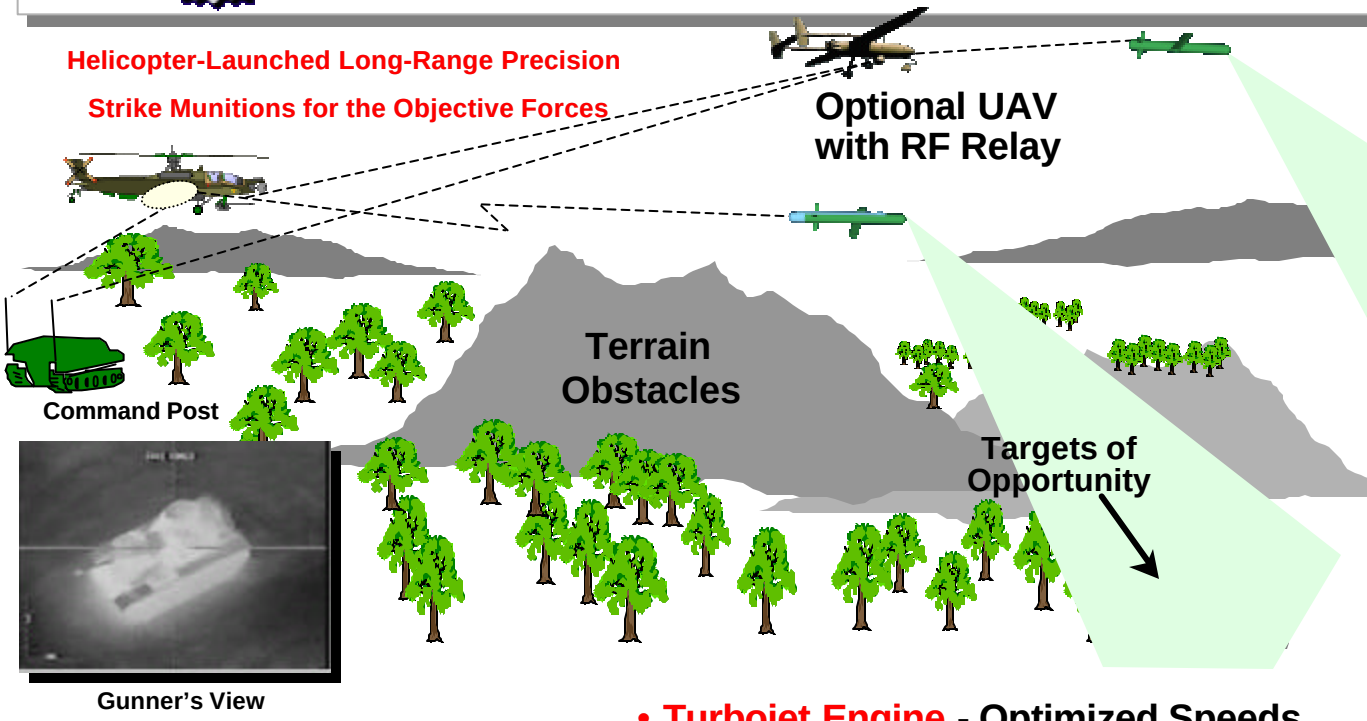


NETFIRES TECHNICAL CHALLENGES

- Networked Missile Communications :
  - **Line-of-Sight and Range Limitations**
  - **Performance in Presence of Jamming Environment**
  - **Bandwidth Sharing**
    - **In intense communications environment (voice & data)**
    - **Imagery from Multiple Missiles in Flight**
- Distributed automated fire control:
  - **Coordination within FCS and Objective Force C3 Architecture**
  - **Techniques to employ networked NLOS remote robotic fires**
- Cooperative engagements and target acquisition:
  - **Methods for missile engagements**
    - PAM + LAM, PAM/LAM counter air, PAM/LAM + UAV, LAM MTI, LAM counter ECM, AJ, etc
  - Optimization of Missile Sensor Package and ATR./ATA for targets in Clutter
- Command /Launch Unit (C/LU) and platform integration:
  - **Techniques for integrating C/LU into the force**
    - (Air assault, HMMWV, fighting vehicle, logistics and transportation)

Loitering Attack Munition for Aviation (LAM-A) (NETFIRES DERIVATIVE)

Helicopter-Launched Long-Range Precision Strike Munitions for the Objective Forces



Gunner's View

- **Launchers:**
  - Apache
  - Comanche
  - Cobra
  - Future Rotary Wing Platforms (Manned or Un-manned)
- **Increases Helicopter Standoff:** 40-60 Km

- **Turbojet Engine** - Optimized Speeds
  - Search / Combat ID
  - Loiter / Attack / BDA
- **Networked RF Datalink** for Fast Target Image Updates and BDA
- **In-Flight Re-Direct** / Target Override / Regret Avoidance
- **FY03 Transition** to Aviation Hunter-Standoff Killer ACTD

- **Joint Program** with DARPA Networked-Fires LAM

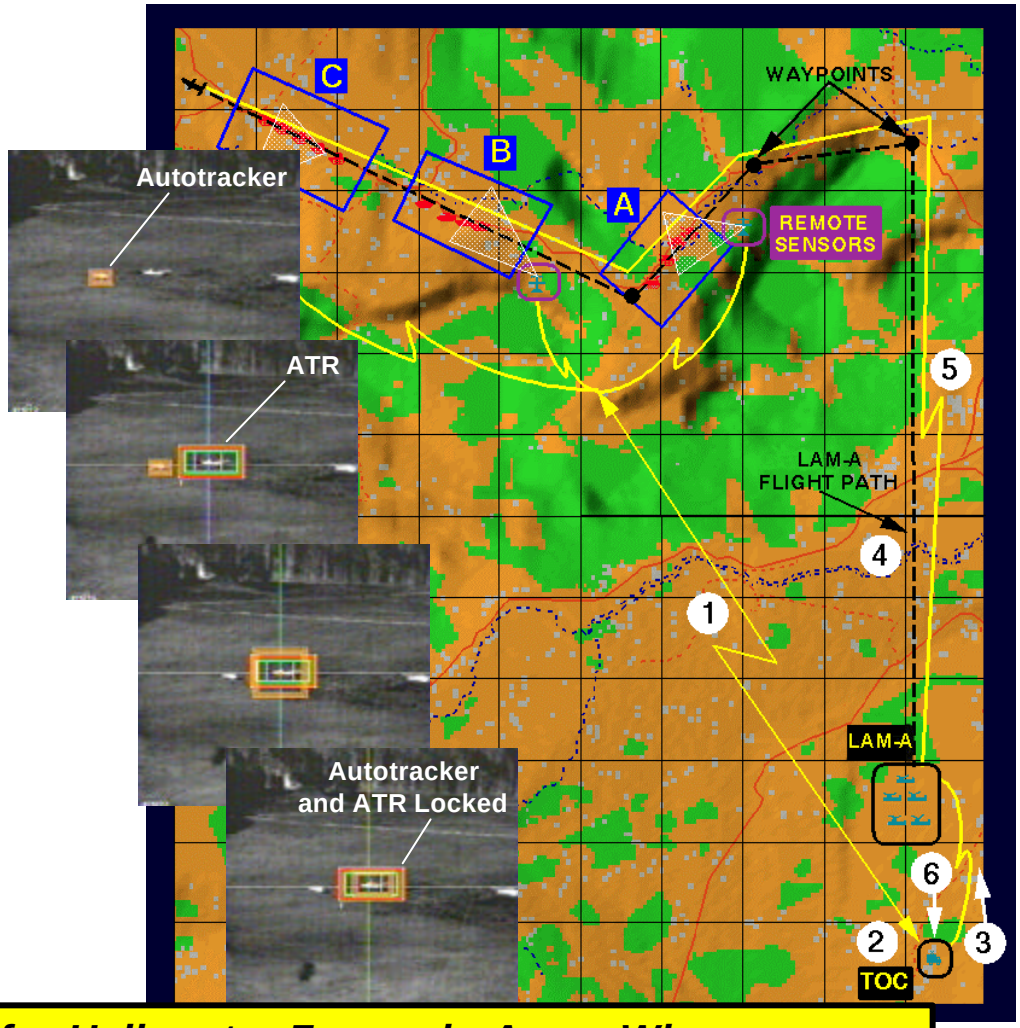
- Ideal for **MOUT Targets**

- **Surgical Kill** at Long Range
  - High Pk – Minimizes Collateral Damage
- **Meets Joint Common Missile Block II** Objective Loiter and MITL Datalink Requirements

LAM-A
Warfighting Impact

Need for LAM-A based on High Apache Attrition in Wargame Analysis

- **40-60 Km Range** Covers Aviation Operational Area of Responsibility
- **Enhanced Objective Force Crew Survivability** – Greater Standoff Range for Helicopter Launch Platform
- **Non-Direct Flight Paths** for High Target Detection Probability
- **Minimized Timelines** for Targeting to Accelerate Battle Tempo
- **Built-in Loiter Capability** for Fast Targeting / Combat ID / BDA on Targets which may be Fleeting
- **Real-time ATA / ATR Target Cueing** Reduced Gunner Workload
- **Missile Imagery** Transmits to Launcher, Airborne Commander (A2C2S), or Forward Observer over Tactical FCS Network
- **Enhanced Loss Exchange Ratios**

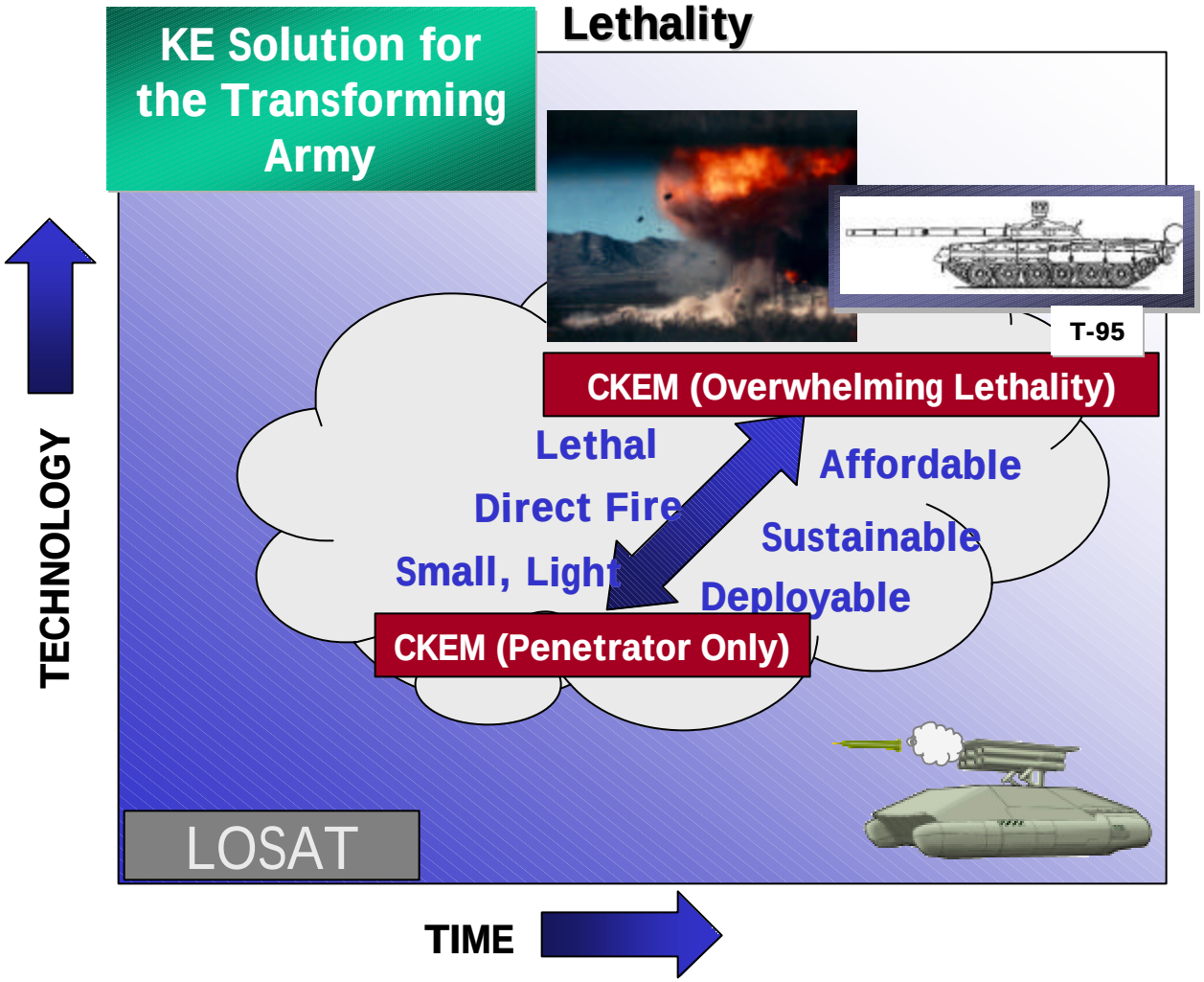


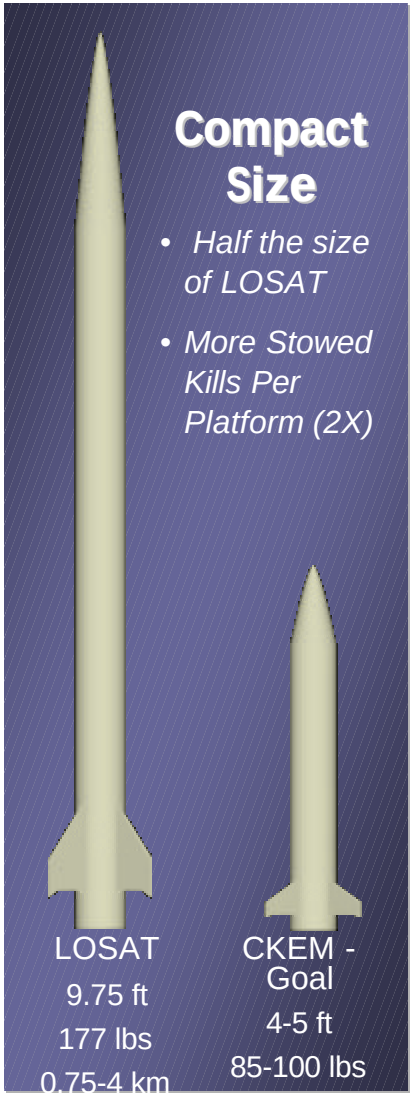
LAM-A Serves as Eyes for Helicopter Forces in Areas Where Low-level Flight is High Risk.

FUTURE COMBAT SYSTEM AND THE FUTURE TRANSPORT ROTORCRAFT DILEMMA

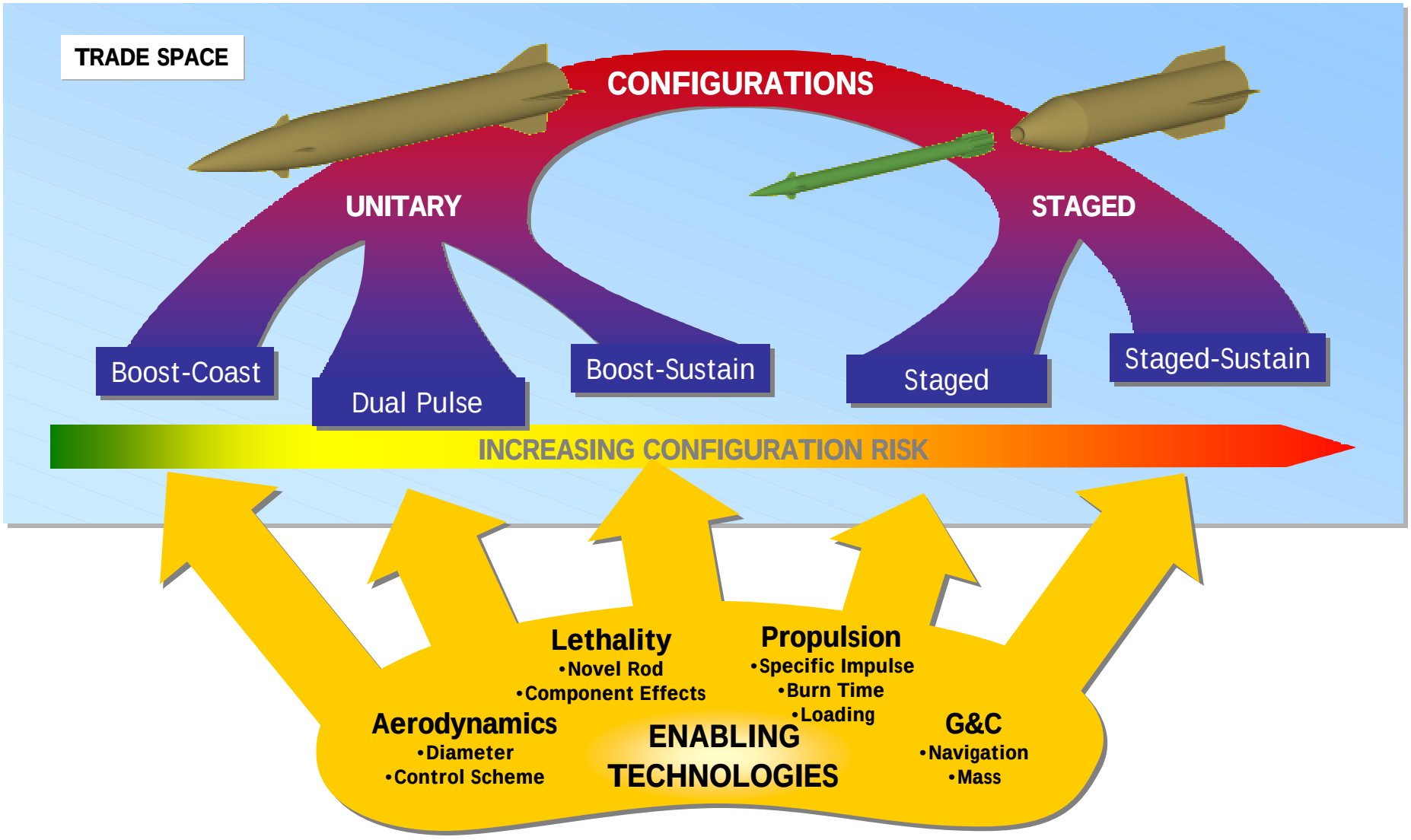
- Future Combat System weight is determined by the C-130 lift capability (Max 20 tons)
- Critical vertical envelopment operations require the FCS to be transportable by rotorcraft
- Cost of the FTR for 20 ton FCS lift is estimated at $100 Billion
- Improvements to existing heavy lift rotorcraft (CH-47F +) will allow about 10 tons of lift
- Achieving a 10 ton FCS is strongly dependent on minimizing the weight of the main anti-armor weapon system

CKEM Approach

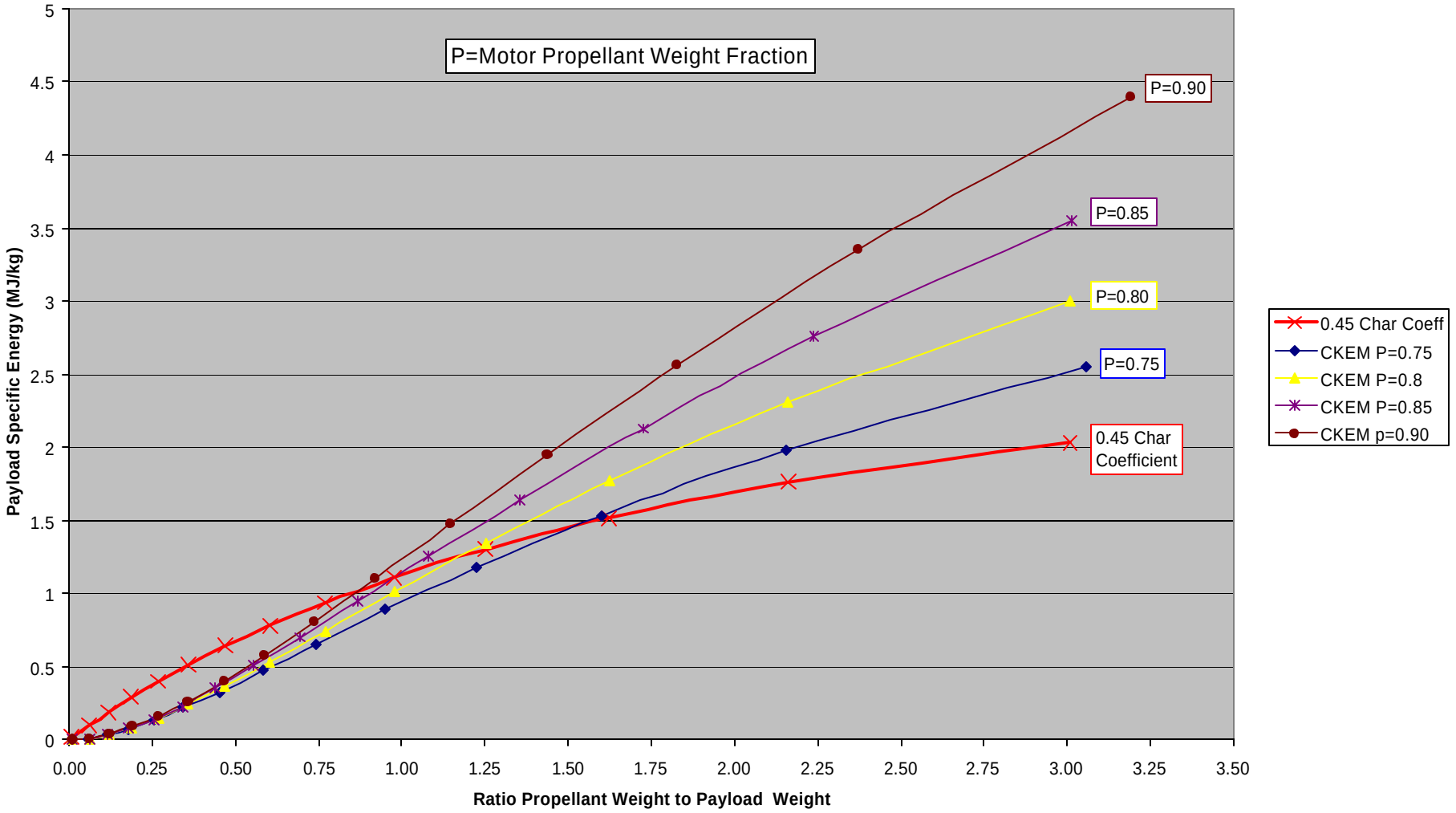




Trade Study Hierarchy

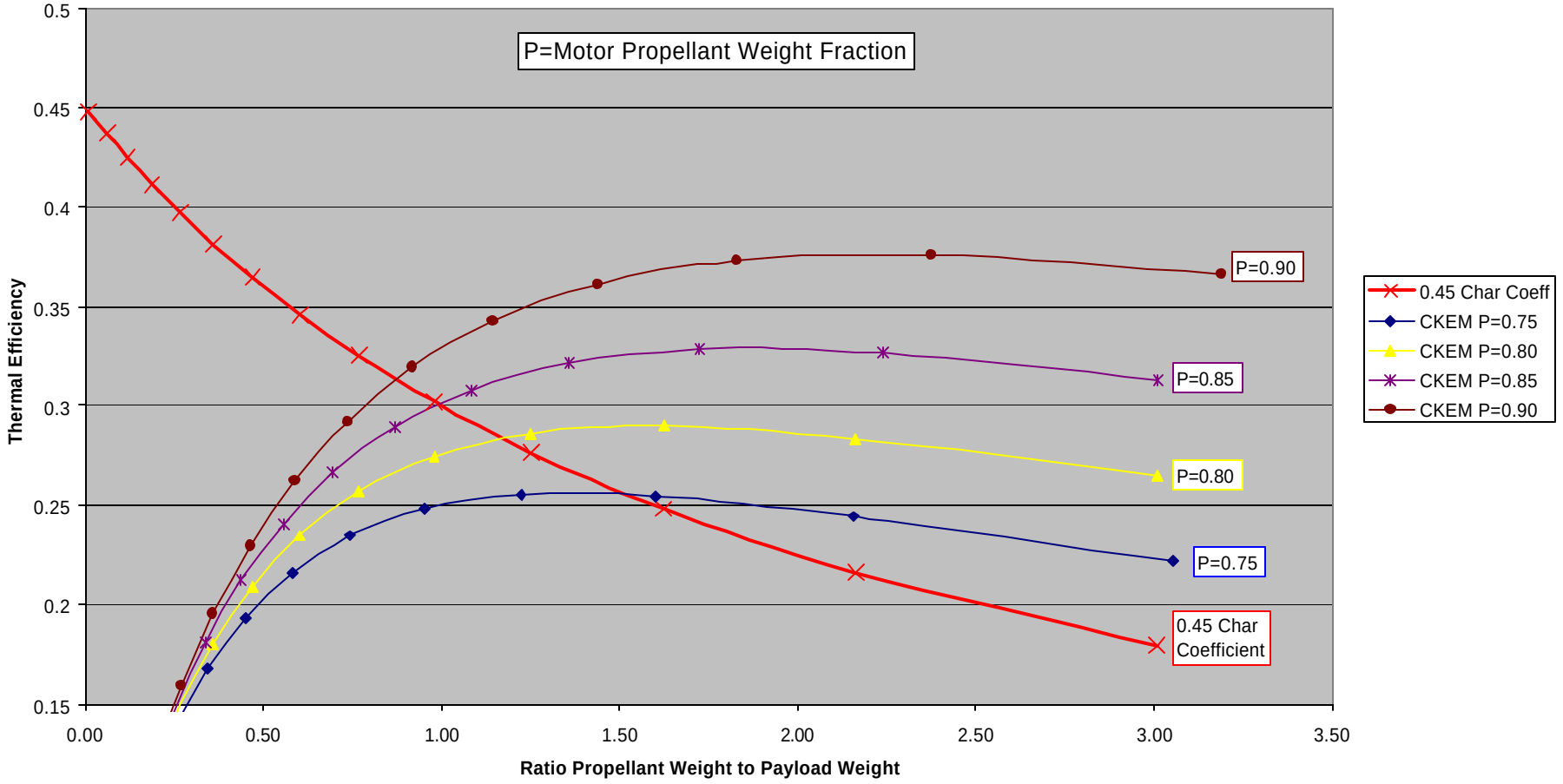


Payload Specific Energy Comparison



Thermal Efficiency Comparison

Fraction of Propellant Energy Converted To Payload Kinetic Energy

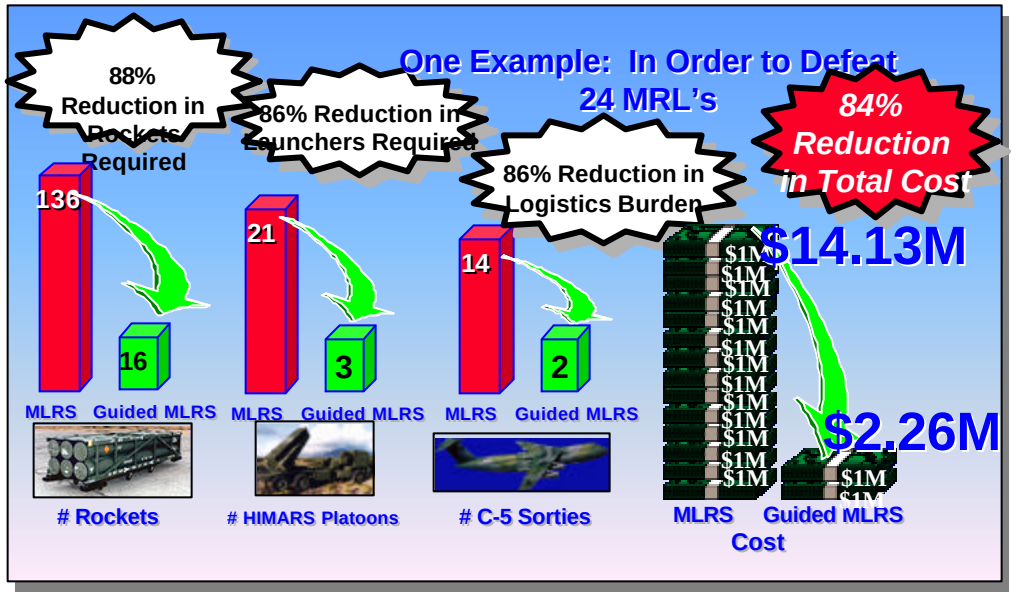


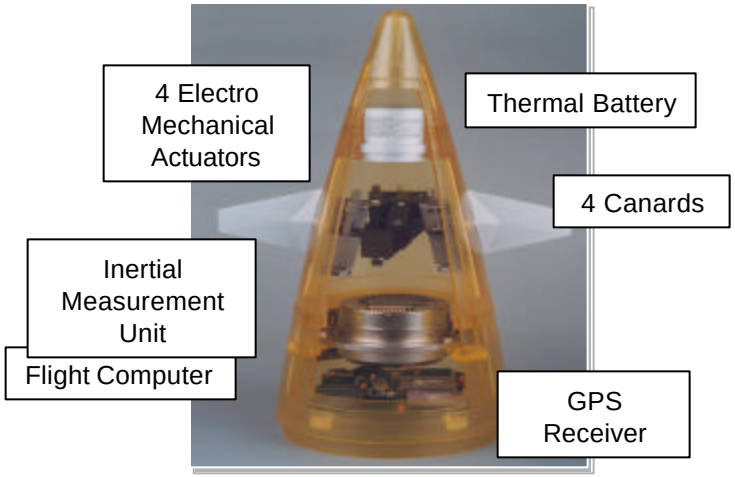
Conclusions for CKEM vs Cannon for the FCS

- Given:
  - **Munition weights per MJ of penetrator energy are approximately equal**
  - **Missile Launcher and Autoloader are comparable within a few hundred Kg**
- Big Difference is:
  - **Weight of the Cannon**
  - **Weight of the Cannon Mounting and Recoil System**
- Demand for Robust Overmatch Capability and Transport Capability by C-130 and Heavy Lift Helicopter:
  - **Places premium on Lightweight Armament System**
  - **Requires substantially greater than 120 mm Cannon equivalent performance**

The Guided MLRS Role

- GMLRS is fired from C-130 Transportable HIMARS
- Use of FCS Vehicle Optional
- Highly improved accuracy (2.1 meters @ 49Km)
- Order of Magnitude Reduction in Logistics Burden
- Guidance Section is compact, simple, inexpensive





Summary

- Transformation is presently focused on reducing logistics burden via the Future Combat System
  - The role of aviation and the FTR is yet to be developed
- Precision Tactical Munitions must play a major role
  - Munition probable kills per logistic ton, plus high favorable Loss Exchange Ratios will be critical metrics
  - Precision Missile Systems are essential to achieve a "Responsive, Deployable, Agile, Versatile, Lethal, Survivable, Sustainable" Transformed Army